GOING TO MARS

- Launch Opportunity:
  - Timing: Only every 2 years (21d window)
  - Distance: 300M Miles
  - Speed: 59,000 mph
- Extreme Precision Required
**ATLAS V 541**  
**THE DOMINATOR**

- **SUV Sized Payload:** 9000 lbs, 4000 kg Fueled SC  
  2200 lb, 1000 kg Perseverance Rover

- **MM Radioisotope Thermoelectric Generator:** 11 lbs (5 kg) Plutonium

- **Atlas Booster:**  
  50,000 gal LO2  
  30,000 gal RP1

- **AJ60s SRM:**  
  100,000 lbm Solid Propellant x 4

**Special Accommodations for on Pad Installation**

- **High Reliability and Safety**
LIFTOFF!
>2 min: Solid Rocket Motor Jettison
3 ½ min: Outside of atmosphere and Dropped PLF
4 ½ min: All 80k gal Liquid Propellant Expended Booster Engine Cutoff
>4 ½ min: 1st Burn
~ 400 klbm Solid Propellant Expended in <2 min
4 ½ min: 2nd Burn
300-million mile trip to Mars
<1 hour from Launch Mars 2020 Separation
10 7 8
4 ½ min Coast
ATLAS V
MARS 2020
LAUNCH
07.30.20
07:50:00 EDT

140th ULA Launch
100% Successful

BULLSEYE

- Atlas V 541 configuration
- Mars 2020 Perseverance Rover and Ingenuity Helicopter
- High Booster Performance
- Launched at Window Open on July 30, 2020
- 85th Atlas V Mission
- Very Precise Injection Accuracy
- Allowable Requirement Defined by Ellipsoid Injection Error Combining the Energy (C3) and Direction (Ascension & Declination) Required to Reach Mars
- Atlas V’s Ultra Precise Injection Used Just 3.3% of the Allowable Requirement
ULA & JPL
PARTNERING FOR SUCCESS

Unprecedented Accuracy Provides Valuable Mission Extension Lifespan
THANK YOU